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SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-------|-----------------------------|-----------|--------------|
| N.C. | 40242.1.1(B-4964) | 1 | 27 |

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| -DRIVE- | 10+00.00 TO 11+04.91 | 4 | 6 |

**ROADWAY
SUBSURFACE INVESTIGATION**

COUNTY ROCKINGHAM
PROJECT DESCRIPTION BRIDGE NO. 85 OVER SOUTHERN
RAILROAD ON SR 2600 (MIZPAH CHURCH ROAD)

INVENTORY

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

REFERENCE: B-4964

PROJECT: 40242.1.1

PERSONNEL

W. WHICHARD

E. ESTEP

C. CHAMPION

INVESTIGATED BY T. WELLS

DS
DRAWN BY W. FELDER

XC. B
CHECKED BY X. BARRETT

SUBMITTED BY KLEINFELDER

DATE OCTOBER 2014



DocuSigned by:
Thomas Wells 10/16/2014

SIGNATURE

DATE

SIGNATURE

DATE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

| SOIL DESCRIPTION | | | | | GRADATION | | | | ROCK DESCRIPTION | | | | TERMS AND DEFINITIONS |
|--|--|--|--|--|---|--|--|--|--|--|--|--|--|
| SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 208, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 | | | | | WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES. | | | | HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL, SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: WEATHERED ROCK (WR) CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CP) | | | | ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SCREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. |
| SOIL LEGEND AND AASHTO CLASSIFICATION | | | | | ANGULARITY OF GRAINS | | | | WEATHERING | | | | |
| THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED. | | | | | MINERALOGICAL COMPOSITION | | | | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. | | | | |
| COMPRESSIONSIBILITY | | | | | PERCENTAGE OF MATERIAL | | | | | | | | |
| SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50 | | | | | ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE | | | | | | | | |
| GROUND WATER | | | | | | | | | | | | | |
| WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP | | | | | | | | | | | | | |
| MISCELLANEOUS SYMBOLS | | | | | | | | | | | | | |
| ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY | | | | | DIP & DIP DIRECTION OF ROCK STRUCTURES TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE | | | | | | | | |
| RECOMMENDATION SYMBOLS | | | | | | | | | | | | | |
| UNDERCUT EXCAVATION SHALLOW UNDERCUT | | | | | UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK | | | | UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL | | | | |
| ABBREVIATIONS | | | | | | | | | | | | | |
| AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY | | | | | MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITE SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY | | | | VST - VANE SHEAR TEST WEA. - WEATHERED γ - UNIT WEIGHT γ _d - DRY UNIT WEIGHT SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO | | | | |
| TEXTURE OR GRAIN SIZE | | | | | | | | | | | | | |
| U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.75 2.00 0.42 0.25 0.075 0.053 | | | | | | | | | | | | | |
| BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.) | | | | | | | | | | | | | |
| GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3 | | | | | | | | | | | | | |
| SOIL MOISTURE - CORRELATION OF TERMS | | | | | | | | | | | | | |
| SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SHRINKAGE LIMIT SL - LIQUID SHRINKAGE LIMIT | | | | | - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE | | | | | | | | |
| PLASTICITY | | | | | | | | | | | | | |
| NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH | | | | | | | | | | | | | |
| COLOR | | | | | | | | | | | | | |
| DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. | | | | | | | | | | | | | |

| | | | |
|---|---|---------------------|-------------------|
| FRACTURE SPACING | | BEDDING | |
| TERM | SPACING | TERM | THICKNESS |
| VERY WIDE | MORE THAN 10 FEET | VERY THICKLY BEDDED | 4 FEET |
| WIDE | 3 TO 10 FEET | THICKLY BEDDED | 1.5 - 4 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET | THINLY BEDDED | 0.16 - 1.5 FEET |
| CLOSE | 0.16 TO 1 FOOT | VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET | THICKLY LAMINATED | 0.008 - 0.03 FEET |
| | | THINLY LAMINATED | < 0.008 FEET |
| INDURATION | | | |
| FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. | | | |
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. | | |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. | | |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. | | |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. | | |
| ELEVATION: 758.56 FEET | | | |
| NOTES: | | | |
| FIAD - FILLED IN AFTER DRILLING | | | |
| ROADWAY BORING ELEVATIONS OBTAINED USING B4964.LS.TIN.TIN FILE DATED 6/30/14 | | | |

09/08/99

TIP PROJECT: B-4964

CONTRACT:

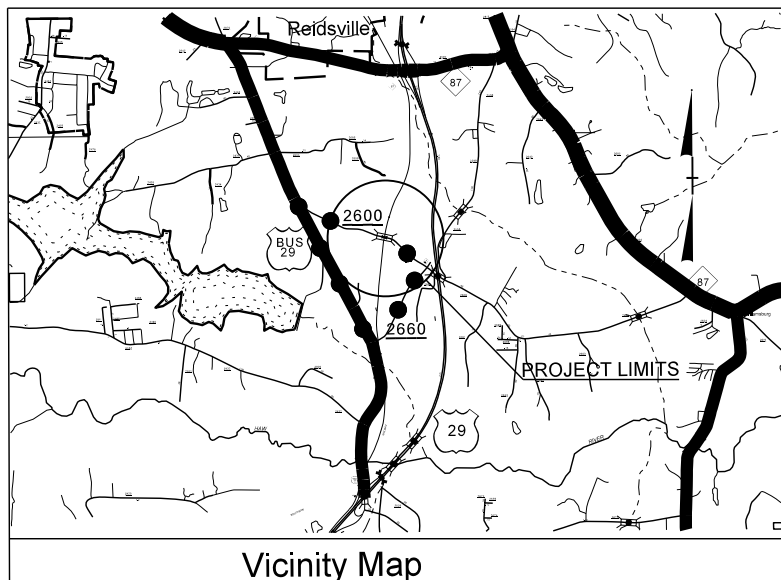
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

ROCKINGHAM COUNTY

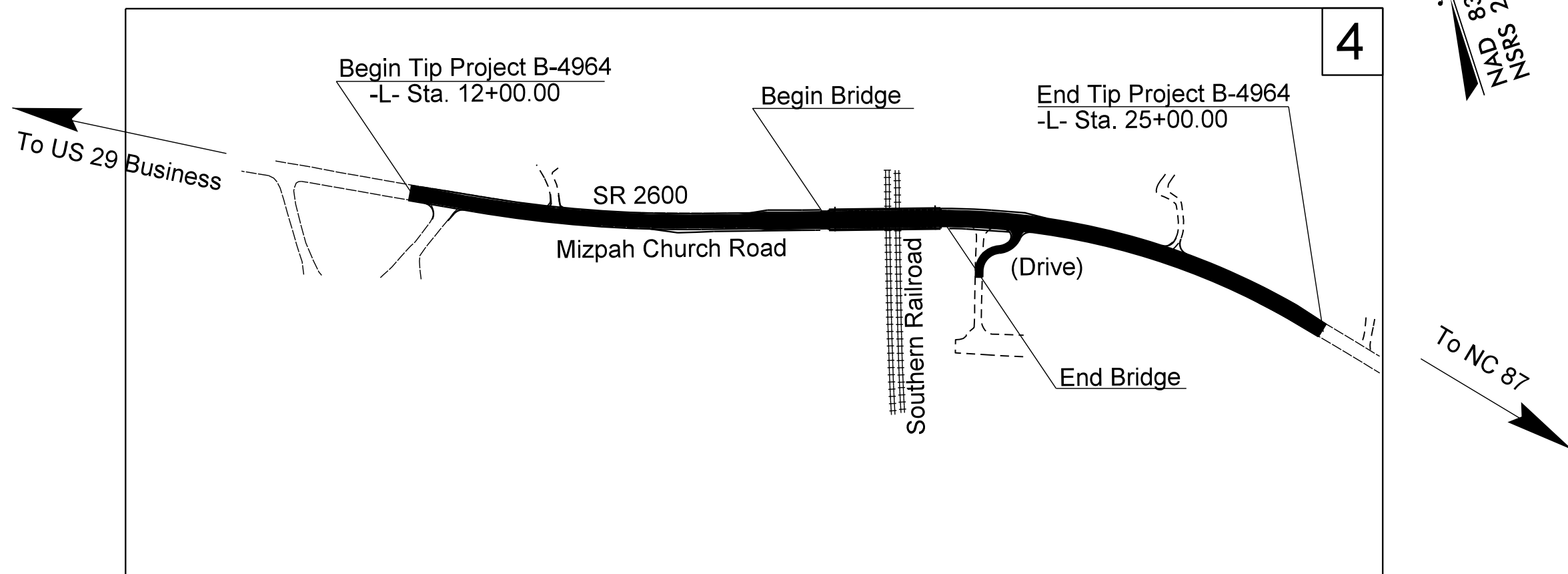
LOCATION: Bridge #85 over Southern Railroad on SR 2600 (Mizpah Church Rd)

TYPE OF WORK: Grading, Drainage, Paving, and Structure

| | | | |
|-----------------|-----------------------------|-------------|--------------|
| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
| N.C. | B-4964 | 3 | 27 |
| STATE PROJ. NO. | F.A. PROJ. NO. | DESCRIPTION | |
| 40242.1.1 | BRSTP-2600(1) | PE | |
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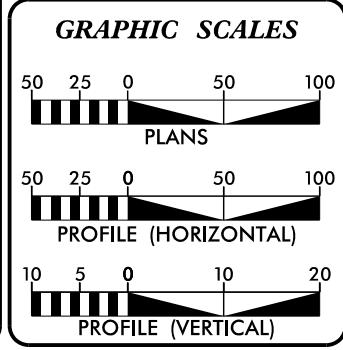


Vicinity Map
●●●●● Offsite Detour Route



4

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



DESIGN DATA

| |
|---------------------|
| ADT 2014 = 1430 vpd |
| ADT 2035 = 1500 vpd |
| DHV = 10 % |
| D = 55 % |
| T = 4 % * |
| V = 50 MPH |
| * TTST 1% DUAL 3% |
| Rural Local |
| Sub Regional Tier |

PROJECT LENGTH

Total Length TIP Project B-4964 = 0.246 Miles

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

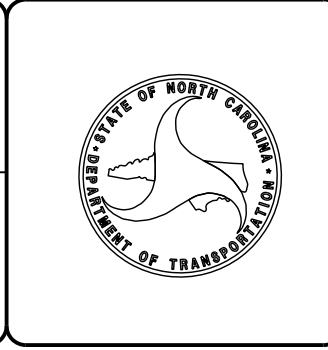
| | |
|---------------------------------------|--|
| 2012 STANDARD SPECIFICATIONS | |
| RIGHT OF WAY DATE: AUGUST 21, 2015 | James Speer, PE PROJECT ENGINEER |
| LETTING DATE: AUGUST 15, 2017 | John Lansford, PE PROJECT DESIGN ENGINEER |

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.





October 10, 2014
File No. 20151548.001A | GSO14R03537

STATE PROJECT: 40242.1.1 (B-4964)
FEDERAL PROJECT: BRSTP-2600(1)
COUNTY: Rockingham
DESCRIPTION: Bridge No. 85 over Southern Railroad on SR 2600 (Mizpah Church Road)

SUBJECT: Geotechnical Report - Inventory

Project Description

This project consists of the reconstruction of 0.25 miles of Mizpah Church Road (-L-) which is a two-lane roadway. Also proposed is the reconstruction of the drive (-DRIVE-) to the east of the bridge which is 104 feet in length.

The geotechnical investigation was conducted during July of 2014. One drill machine, a CME-55, with automatic hammer, was used during the investigation. Standard Penetration Tests were performed at each boring location. Representative soil samples were collected for visual classification in the field and selected samples were submitted for laboratory analysis by Kleinfelder, Inc.

The following alignments, totaling 0.25 miles, were investigated.

| <u>LINE</u> | <u>STATIONS</u> |
|-------------|-------------------|
| -L- | 12+00 to 25+50 |
| -DRIVE- | 10+00 to 11+04.91 |

Areas of Special Geotechnical Interest

- 1) Highly Plastic Clays: Highly plastic clays (PI > 25) were encountered on the project at the following locations:

| <u>LINE</u> | <u>STATIONS</u> | <u>OFFSETS</u> |
|-------------|-----------------|----------------|
| -L- | 12+00 to 25+50 | LT to RT |

A discussion of these highly plastic clay soils is located below in the section titled "Soil Properties".

Physiography and Geology

The project is located in the Piedmont Physiographic Province. The project corridor is comprised primarily of residential and agricultural properties. The general topography of the site consists of rolling hills with flat to moderate slopes along the existing roadway.

Geologically, the project is located within the Milton Belt. Soils are derived from the underlying metamorphic bedrock primarily consisting of biotite gneiss.

Surface water is drained from the corridor by the existing roadway ditches.

Soil Properties

Soils encountered during this investigation are separated into two categories based on origin. They consist of roadway embankment and residual soils.

Roadway Embankment soils are present along the existing roadways (-L-) on the project. These soils consist of wet, soft to stiff, high plasticity, coarse to fine sandy, silty clay (A-7-6). The plasticity index of the roadway embankment soils tested ranged from 28 to 34.

Residual soils are derived from the weathering of underlying biotite gneiss rock. These majority of the residual soils encountered consist of moist to wet, medium stiff to very stiff, high plasticity, coarse to fine sandy, silty clay (A-7-5 and A-7-6), moist to wet, medium stiff to very stiff, low plasticity, coarse to fine sandy, silt (A-4), moist to saturated, loose to very dense, non-plastic, silty, coarse to fine sand (A-2-4) Highly plastic clays are generally found from the surface elevation to depths generally ranging from 2 to 5 feet below the existing ground surface. Minor amounts of moist to wet, stiff to very stiff, low plasticity, coarse to fine sandy, clayey silt (A-5) are also present. The plasticity index of the residual soils tested ranged from 29 to 48.

Rock Properties

Deep weathered rock was encountered along the existing roadways (-L-) at elevations ranging from 699.4 to 703.9 feet (MSL). The majority of the weathered rock consists of brown, light gray, white, light brown, gray, and dark gray, biotite gneiss.

Groundwater

Groundwater generally occurs well below the ground surface along the existing roadways (-L-) of the project. Groundwater was encountered at elevations ranging from 721.6 to 724.1 feet below the existing ground surface.

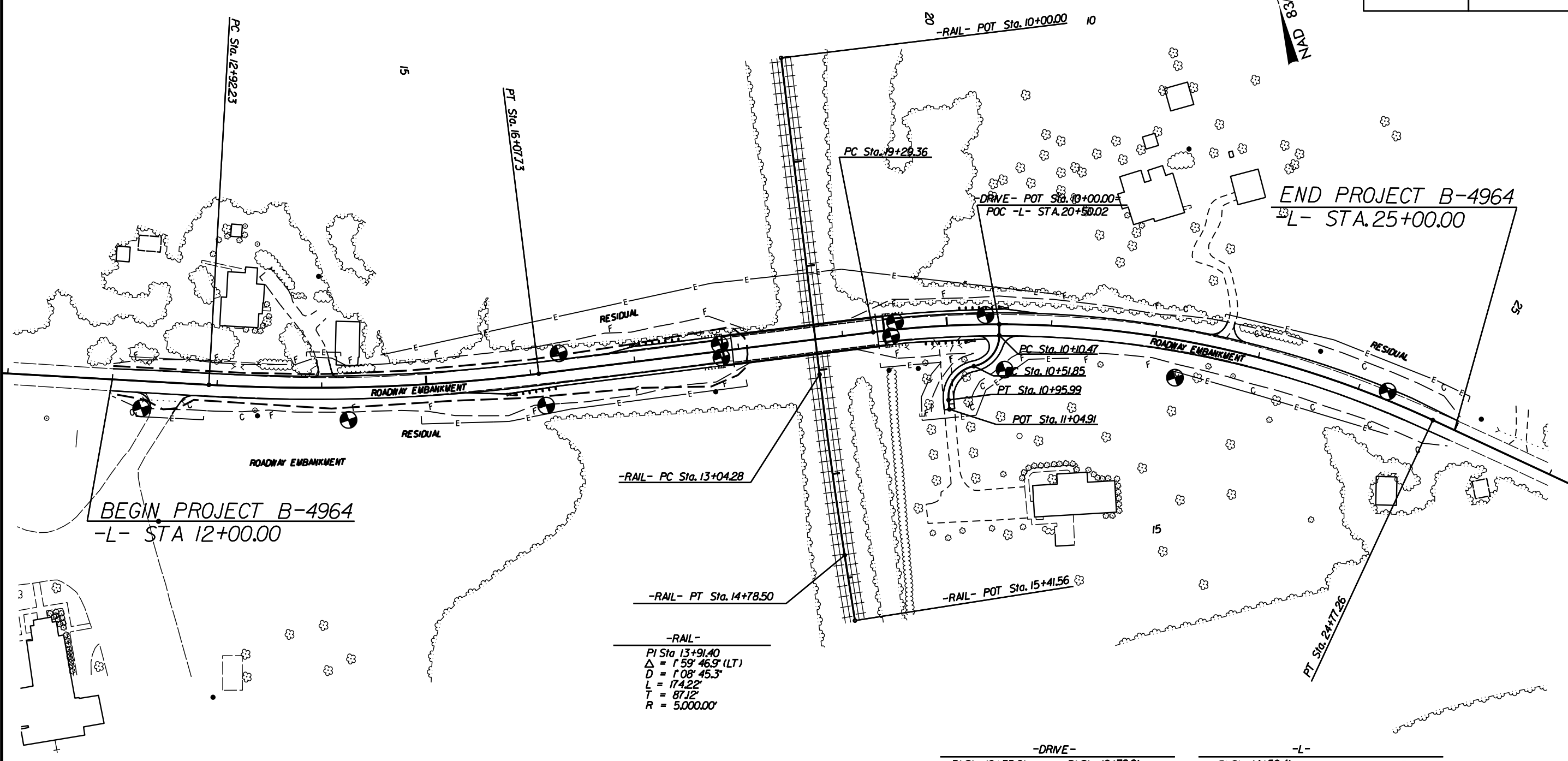
Prepared by,

Thomas R. Wells, P.E.
Senior Professional

Xavier C. Barrett, P.E.
Principal Professional

TRW/XCB:cas

| | |
|--|---------------------|
| PROJECT REFERENCE NO. B-4964 | SHEET NO. 4 |
| RW SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |
| INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION | |



BEGIN PROJECT B-4964
-L- STA 12+00.00

END PROJECT B-4964
-L- STA. 25+00.00

-RAIL- PC Sta. 13+04.28

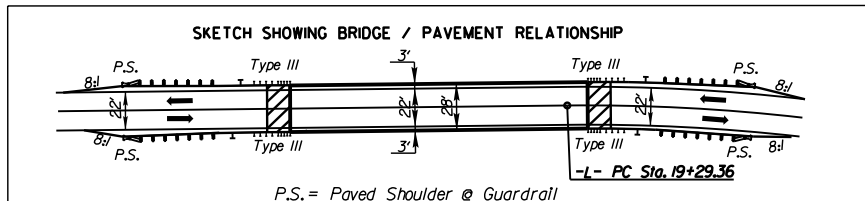
-RAIL- PT Sta. 14+78.50

-RAIL- POT Sta. 15+41.56

-RAIL-
 PI Sta 13+91.40
 $\Delta = 1^{\circ} 59' 46.9''$ (LT)
 $D = 1^{\circ} 08' 45.3''$
 $L = 174.22'$
 $T = 87.12'$
 $R = 5,000.00'$

-DRIVE-
 PI Sta 10+35.21 PI Sta 10+79.01
 $\Delta = 79^{\circ} 01' 16.3''$ (RT) $\Delta = 84^{\circ} 18' 45.8''$ (LT)
 $D = 190^{\circ} 59' 09.4''$ $D = 190^{\circ} 59' 09.4''$
 $L = 41.38'$ $L = 44.15'$
 $T = 24.74'$ $T = 27.16'$
 $R = 30.00'$ $R = 30.00'$

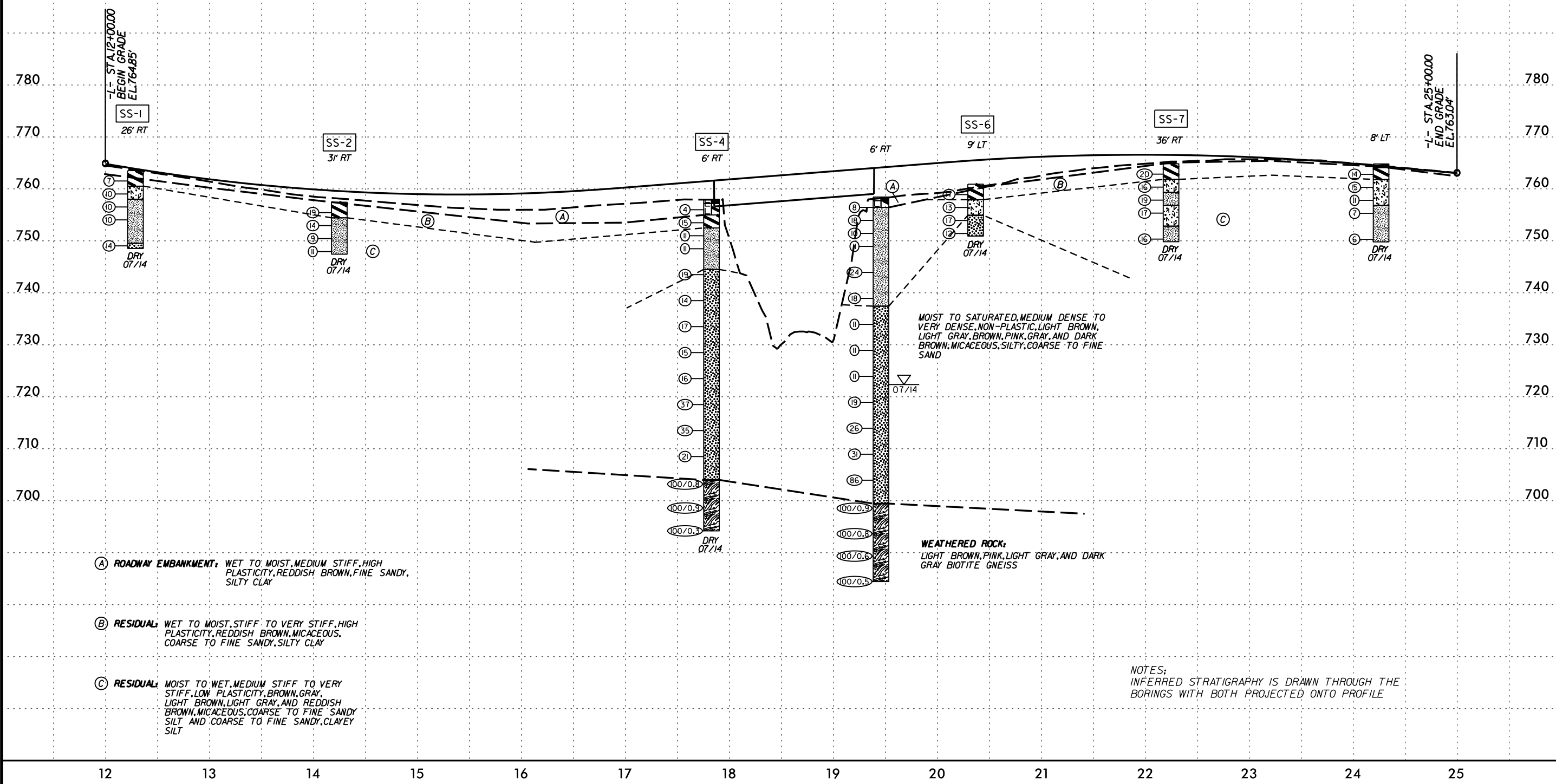
-L-
 PI Sta 14+50.41 PI Sta 22+10.67
 $\Delta = 10^{\circ} 19' 47.1''$ (LT) $\Delta = 32^{\circ} 01' 59.2''$ (RT)
 $D = 3^{\circ} 16' 26.6''$ $D = 5^{\circ} 50' 47.4''$
 $L = 315.50'$ $L = 547.90'$
 $T = 158.18'$ $T = 281.32'$
 $R = 1,750.00'$ $R = 980.00'$
 $SE = .05$ $SE = .06$
 $RO = 110'$ $RO = 132'$
 $V = 50\text{mph}$ $V = 50\text{mph}$



Note: "Tentative proposed right of way and temporary construction easements are shown for early utilities coordination and are subject to change based on further design recommendations"

5/14/99

| | |
|---|-----------------------|
| PROJECT REFERENCE NO. B-4964 | SHEET NO. 5 |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |
| INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION | |
| PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION | |



- (A) **ROADWAY EMBANKMENT:** WET TO MOIST, MEDIUM STIFF, HIGH PLASTICITY, REDDISH BROWN, FINE SANDY, SILTY CLAY
- (B) **RESIDUAL:** WET TO MOIST, STIFF TO VERY STIFF, HIGH PLASTICITY, REDDISH BROWN, MICACEOUS, COARSE TO FINE SANDY, SILTY CLAY
- (C) **RESIDUAL:** MOIST TO WET, MEDIUM STIFF TO VERY STIFF, LOW PLASTICITY, BROWN, GRAY, LIGHT BROWN, LIGHT GRAY, AND REDDISH BROWN, MICACEOUS, COARSE TO FINE SANDY SILT AND COARSE TO FINE SANDY, CLAYEY SILT

MOIST TO SATURATED, MEDIUM DENSE TO VERY DENSE, NON-PLASTIC, LIGHT BROWN, LIGHT GRAY, BROWN, PINK, GRAY, AND DARK BROWN, MICACEOUS, SILTY, COARSE TO FINE SAND

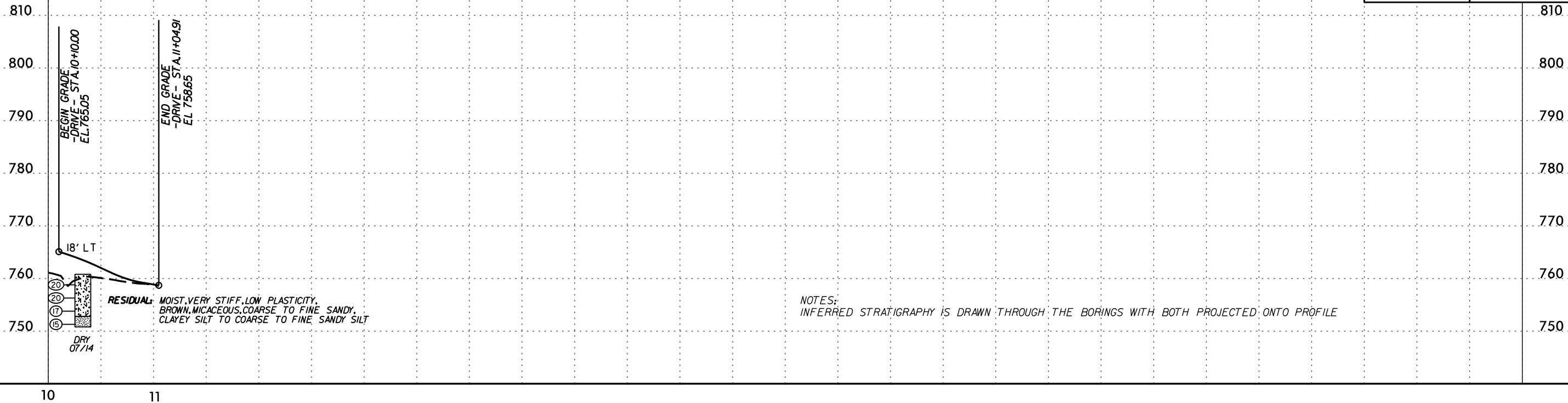
WEATHERED ROCK:
LIGHT BROWN, PINK, LIGHT GRAY, AND DARK GRAY BIOTITE GNEISS

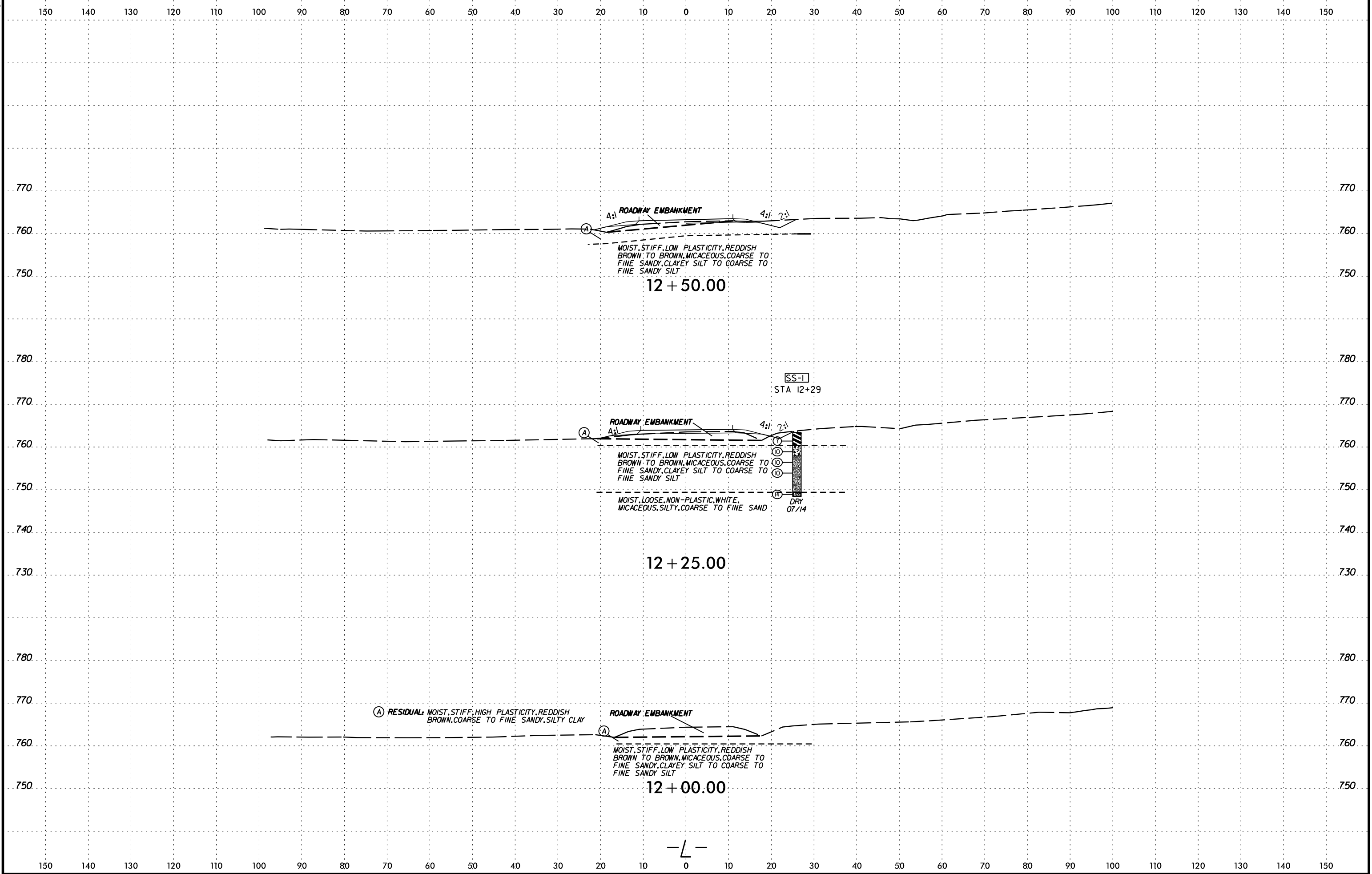
NOTES:
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO PROFILE

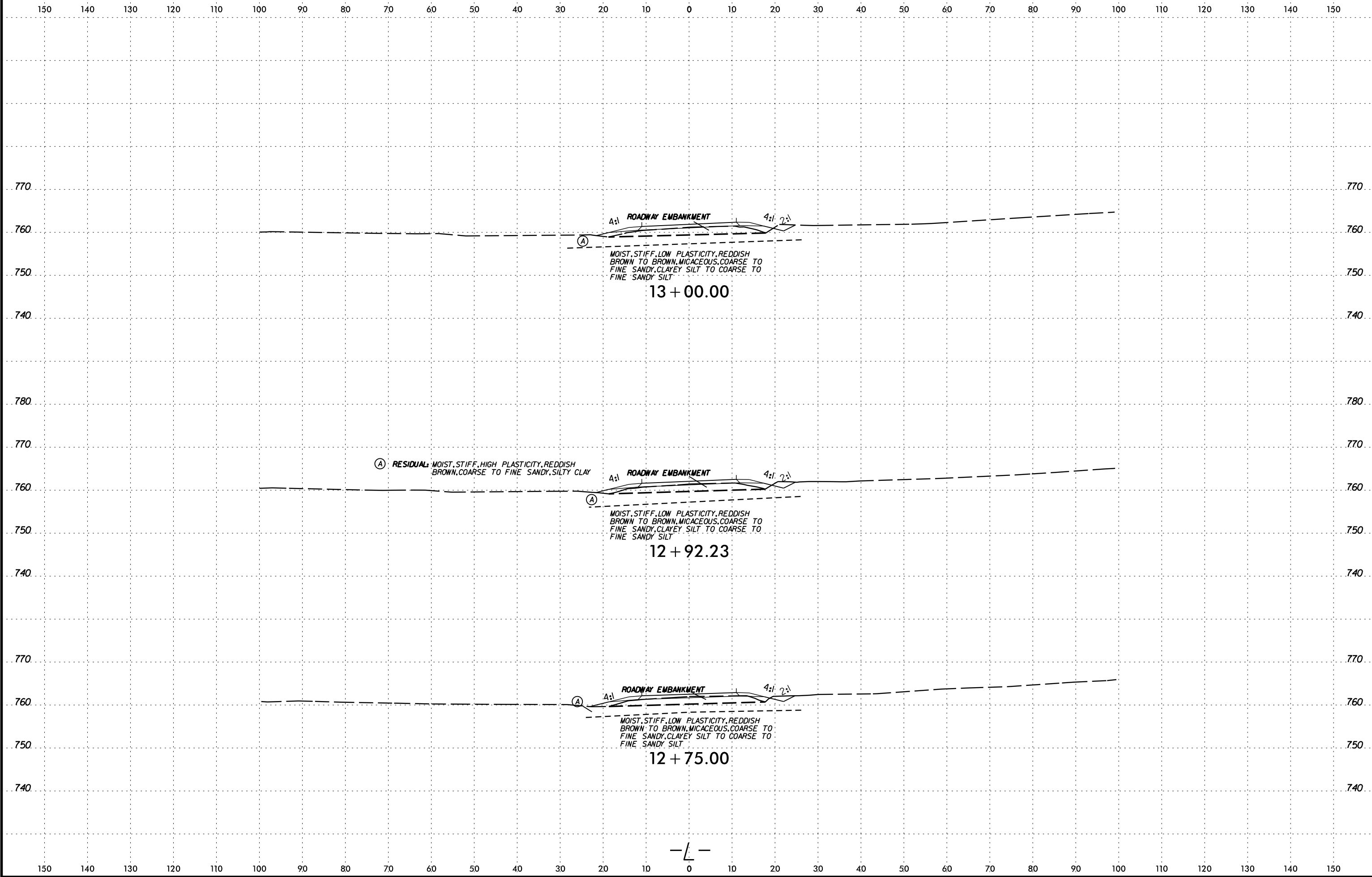
5/28/99

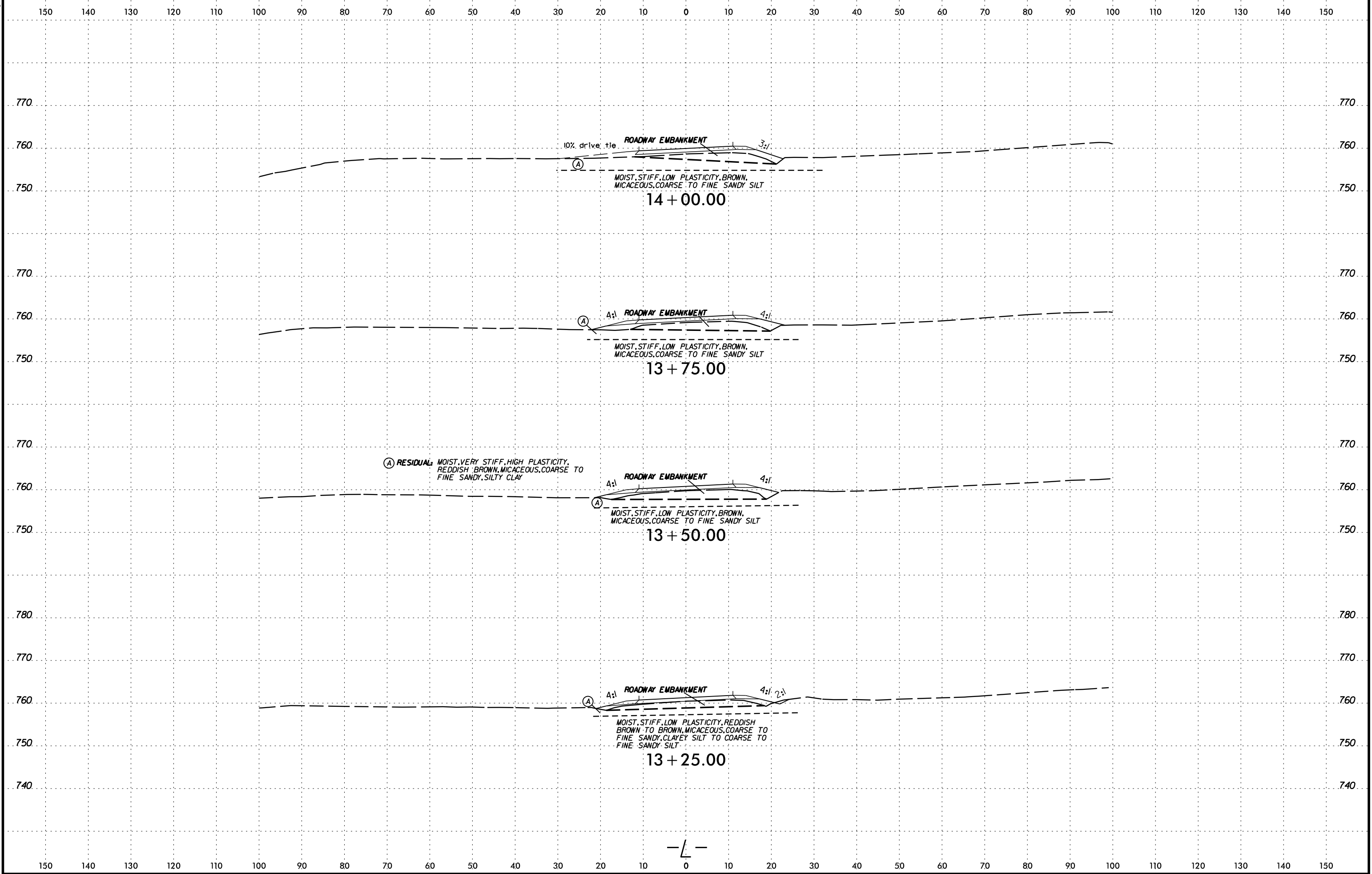
- DRIVE -

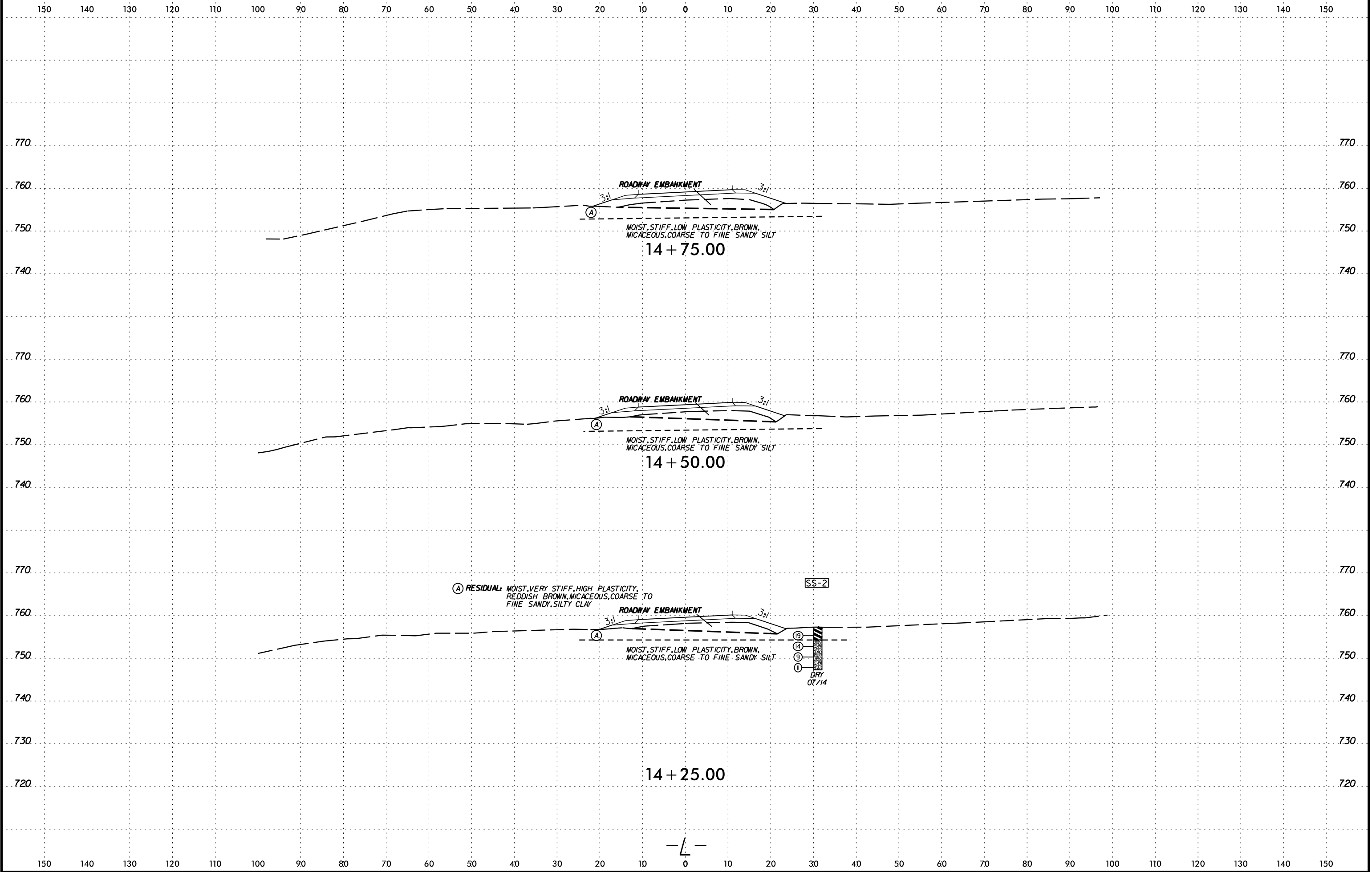
| | |
|--|-----------------------|
| PROJECT REFERENCE NO. <i>B-4964</i> | SHEET NO. <i>6</i> |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |
| INCOMPLETE PLANS <small>DO NOT USE FOR R/W ACQUISITION</small> | |
| PRELIMINARY PLANS <small>DO NOT USE FOR CONSTRUCTION</small> | |

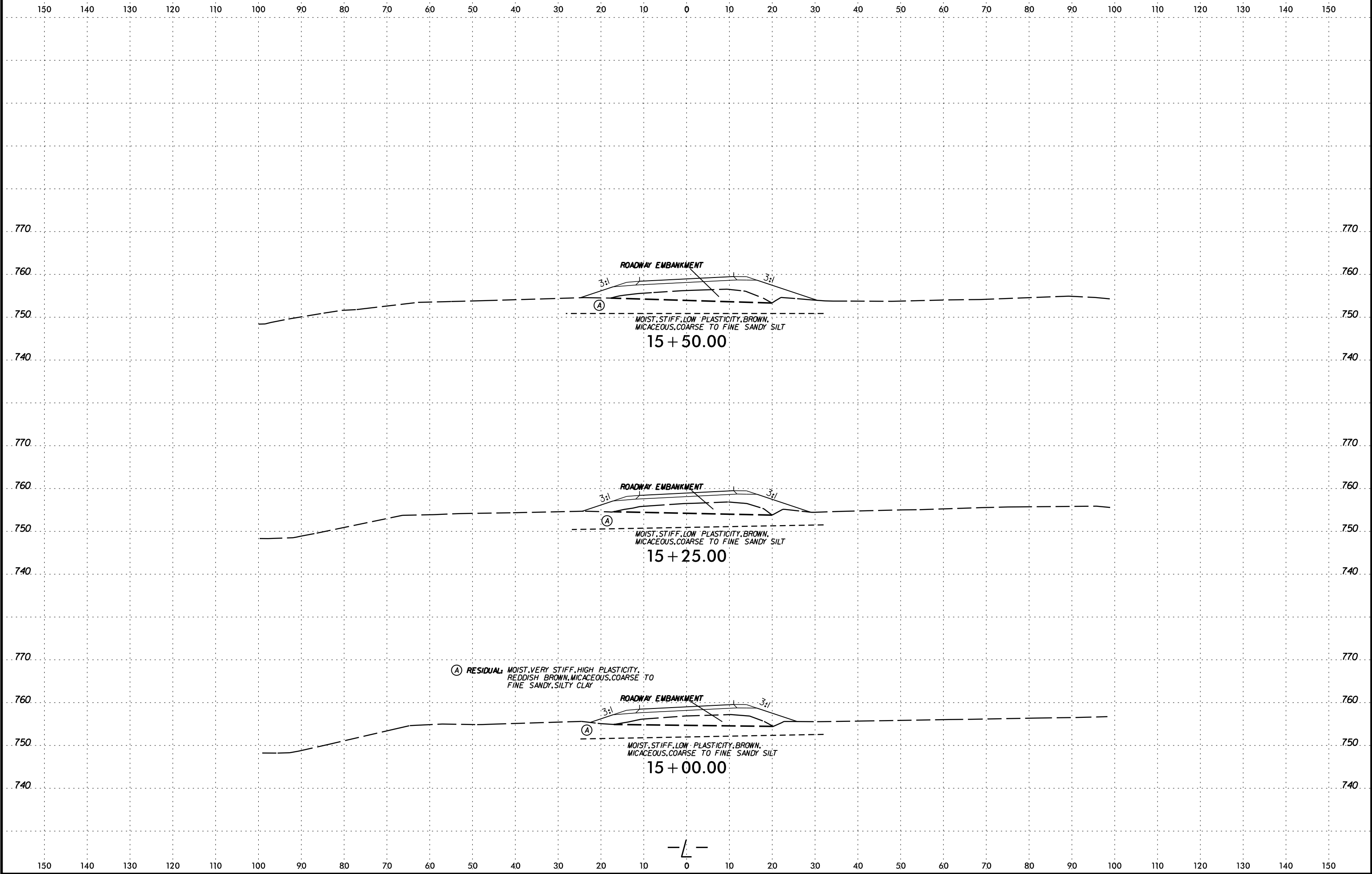










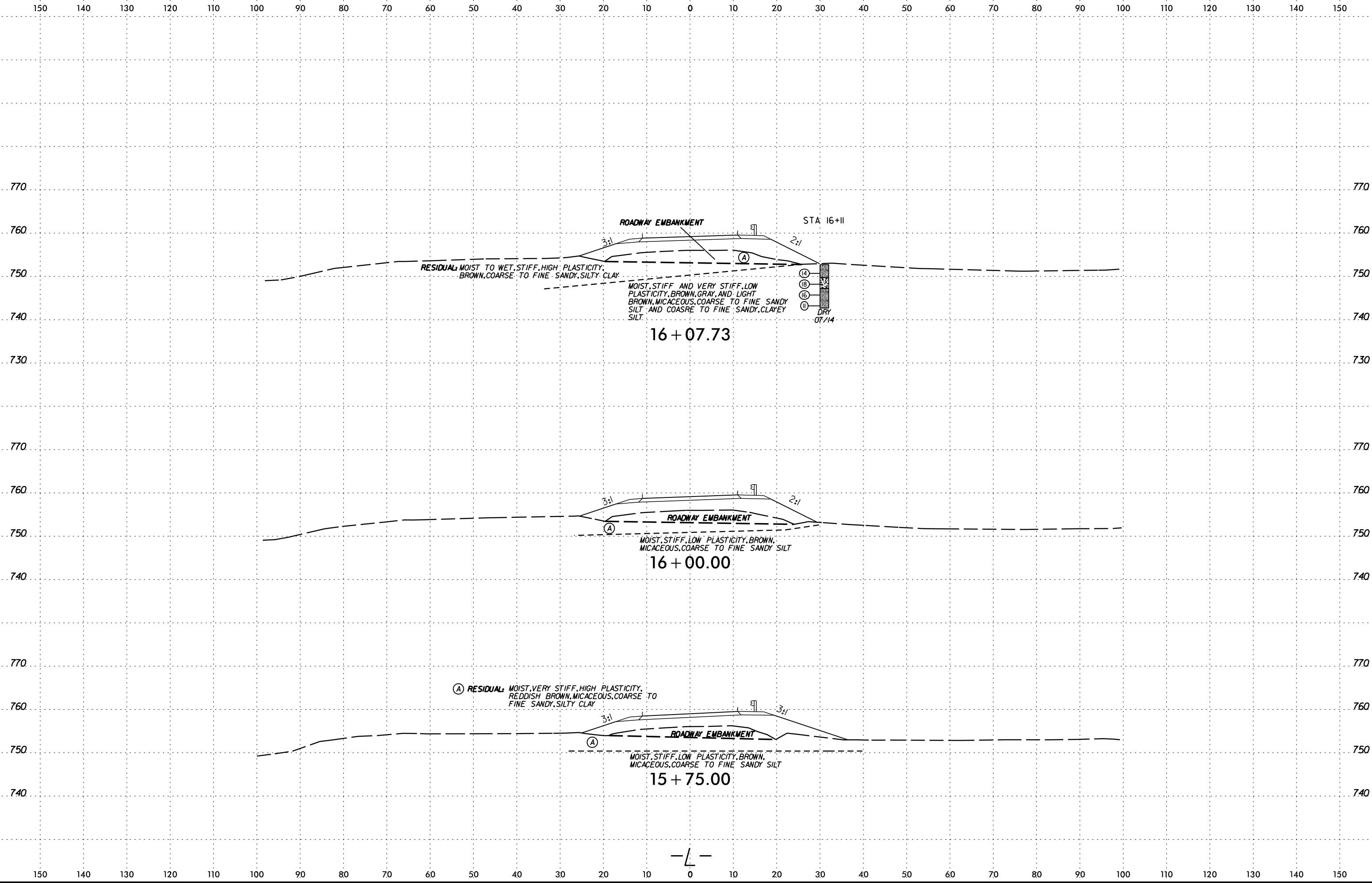


8/23/99



PROJ. REFERENCE NO.
B-4964

SHEET NO.
12

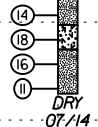


ROADWAY EMBANKMENT

STA 16+11

RESIDUAL: MOIST TO WET, STIFF, HIGH PLASTICITY,
BROWN, COARSE TO FINE SANDY, SILTY CLAY

MOIST, STIFF AND VERY STIFF, LOW PLASTICITY, BROWN, GRAY, AND LIGHT BROWN, MICACEOUS, COARSE TO FINE SANDY SILT AND COARSE TO FINE SANDY, CLAYEY SILT



16+07.73

ROADWAY EMBANKMENT

MOIST, STIFF, LOW PLASTICITY, BROWN, MICACEOUS, COARSE TO FINE SANDY SILT

16+00.00

(A) RESIDUAL: MOIST, VERY STIFF, HIGH PLASTICITY, REDDISH BROWN, MICACEOUS, COARSE TO FINE SANDY, SILTY CLAY

ROADWAY EMBANKMENT

MOIST, STIFF, LOW PLASTICITY, BROWN, MICACEOUS, COARSE TO FINE SANDY SILT

15+75.00

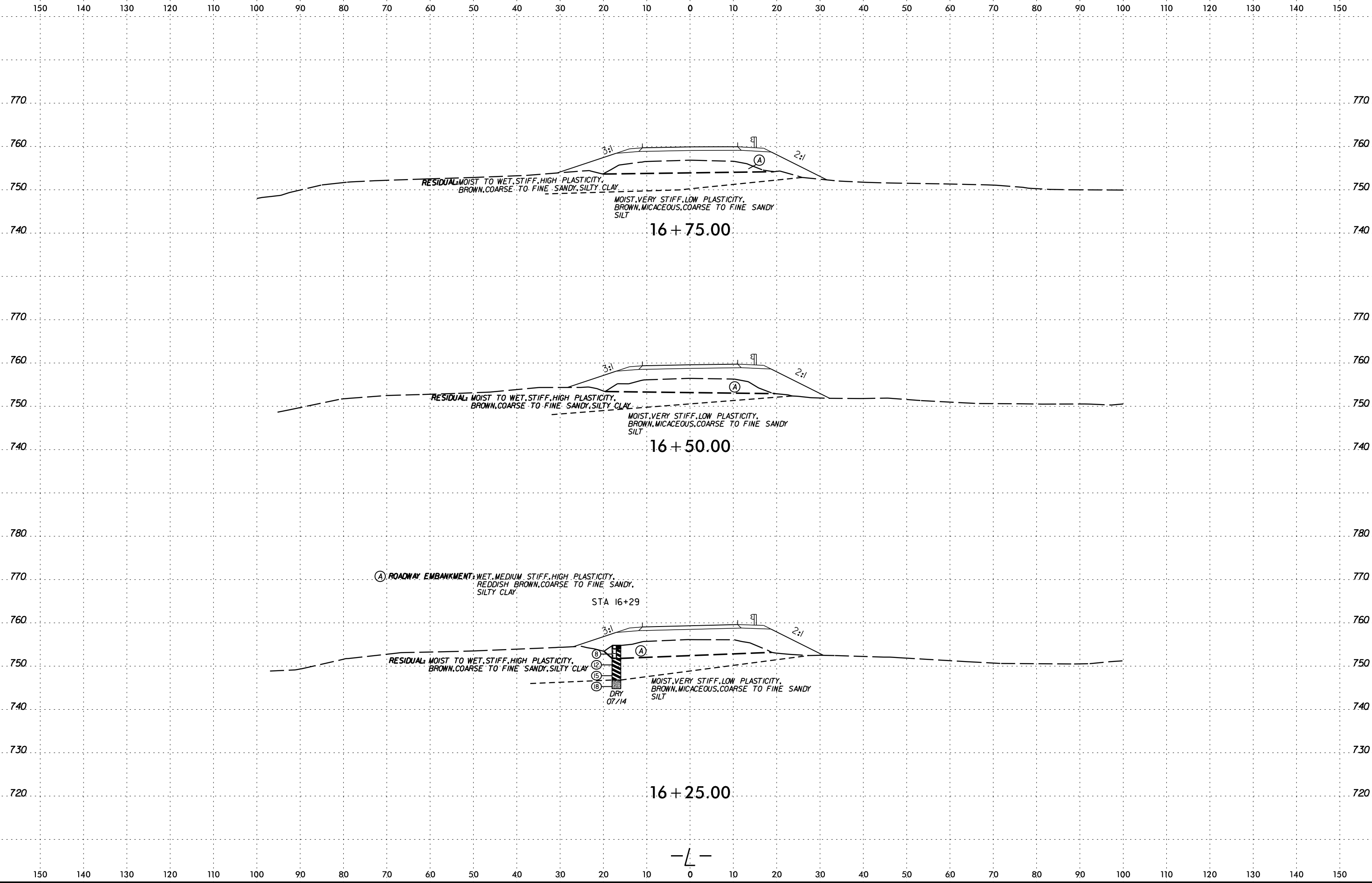
— L —

8/23/99



PROJ. REFERENCE NO.
B-4964

SHEET NO.
13



16 + 75.00

16 + 50.00

16 + 25.00

RESIDUAL: MOIST TO WET, STIFF, HIGH PLASTICITY,
BROWN, COARSE TO FINE SANDY, SILTY CLAY

MOIST, VERY STIFF, LOW PLASTICITY,
BROWN, MICACEOUS, COARSE TO FINE SANDY
SILT

RESIDUAL: MOIST TO WET, STIFF, HIGH PLASTICITY,
BROWN, COARSE TO FINE SANDY, SILTY CLAY

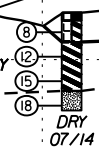
MOIST, VERY STIFF, LOW PLASTICITY,
BROWN, MICACEOUS, COARSE TO FINE SANDY
SILT

(A) ROADWAY EMBANKMENT: WET, MEDIUM STIFF, HIGH PLASTICITY,
REDDISH BROWN, COARSE TO FINE SANDY,
SILTY CLAY

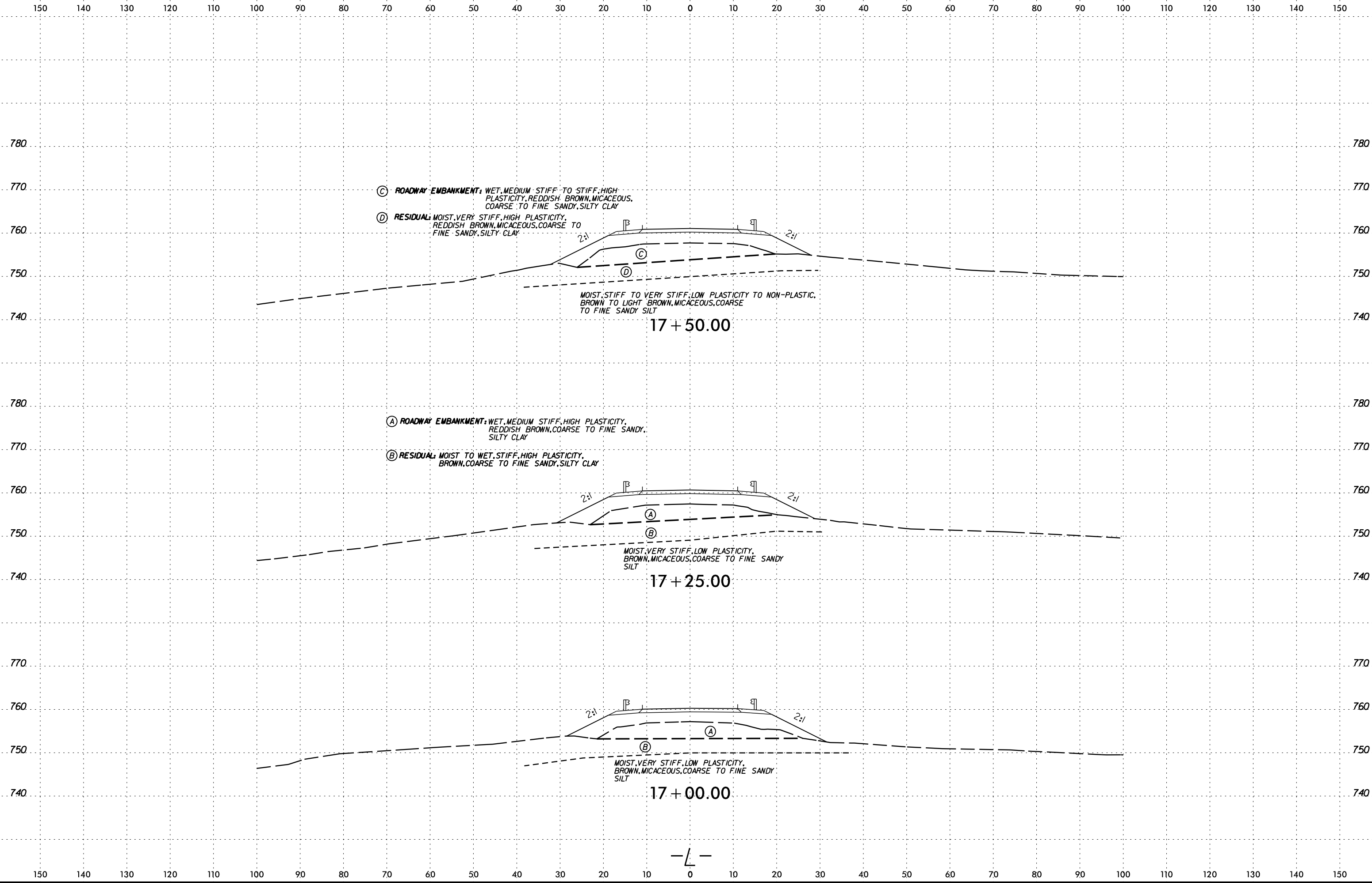
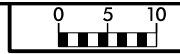
STA 16+29

RESIDUAL: MOIST TO WET, STIFF, HIGH PLASTICITY,
BROWN, COARSE TO FINE SANDY, SILTY CLAY

MOIST, VERY STIFF, LOW PLASTICITY,
BROWN, MICACEOUS, COARSE TO FINE SANDY
SILT



- L -



(C) ROADWAY EMBANKMENT: WET, MEDIUM STIFF TO STIFF, HIGH PLASTICITY, REDDISH BROWN, MICACEOUS, COARSE TO FINE SANDY, SILTY CLAY
 (D) RESIDUAL: MOIST, VERY STIFF, HIGH PLASTICITY, REDDISH BROWN, MICACEOUS, COARSE TO FINE SANDY, SILTY CLAY

MOIST, STIFF TO VERY STIFF, LOW PLASTICITY TO NON-PLASTIC, BROWN TO LIGHT BROWN, MICACEOUS, COARSE TO FINE SANDY SILT

17 + 50.00

(A) ROADWAY EMBANKMENT: WET, MEDIUM STIFF, HIGH PLASTICITY, REDDISH BROWN, COARSE TO FINE SANDY, SILTY CLAY
 (B) RESIDUAL: MOIST TO WET, STIFF, HIGH PLASTICITY, BROWN, COARSE TO FINE SANDY, SILTY CLAY

MOIST, VERY STIFF, LOW PLASTICITY, BROWN, MICACEOUS, COARSE TO FINE SANDY SILT

17 + 25.00

(A) ROADWAY EMBANKMENT: WET, MEDIUM STIFF, HIGH PLASTICITY, REDDISH BROWN, COARSE TO FINE SANDY, SILTY CLAY
 (B) RESIDUAL: MOIST TO WET, STIFF, HIGH PLASTICITY, BROWN, COARSE TO FINE SANDY, SILTY CLAY

MOIST, VERY STIFF, LOW PLASTICITY, BROWN, MICACEOUS, COARSE TO FINE SANDY SILT

17 + 00.00

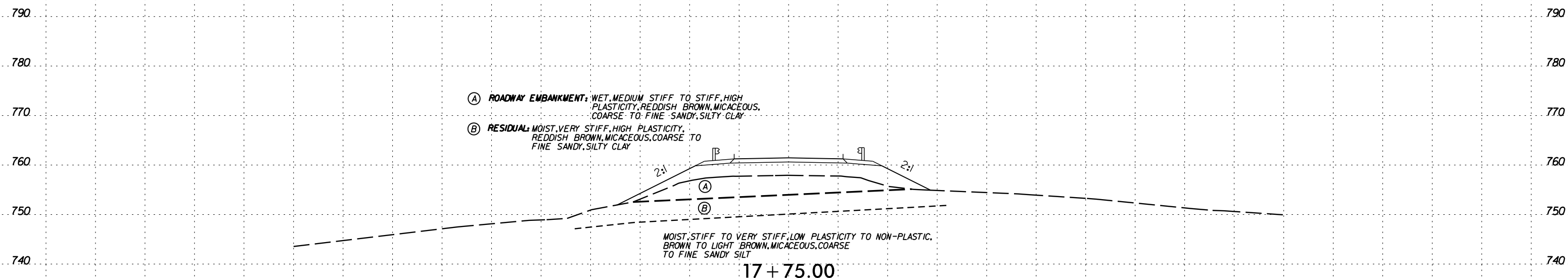
8/23/99



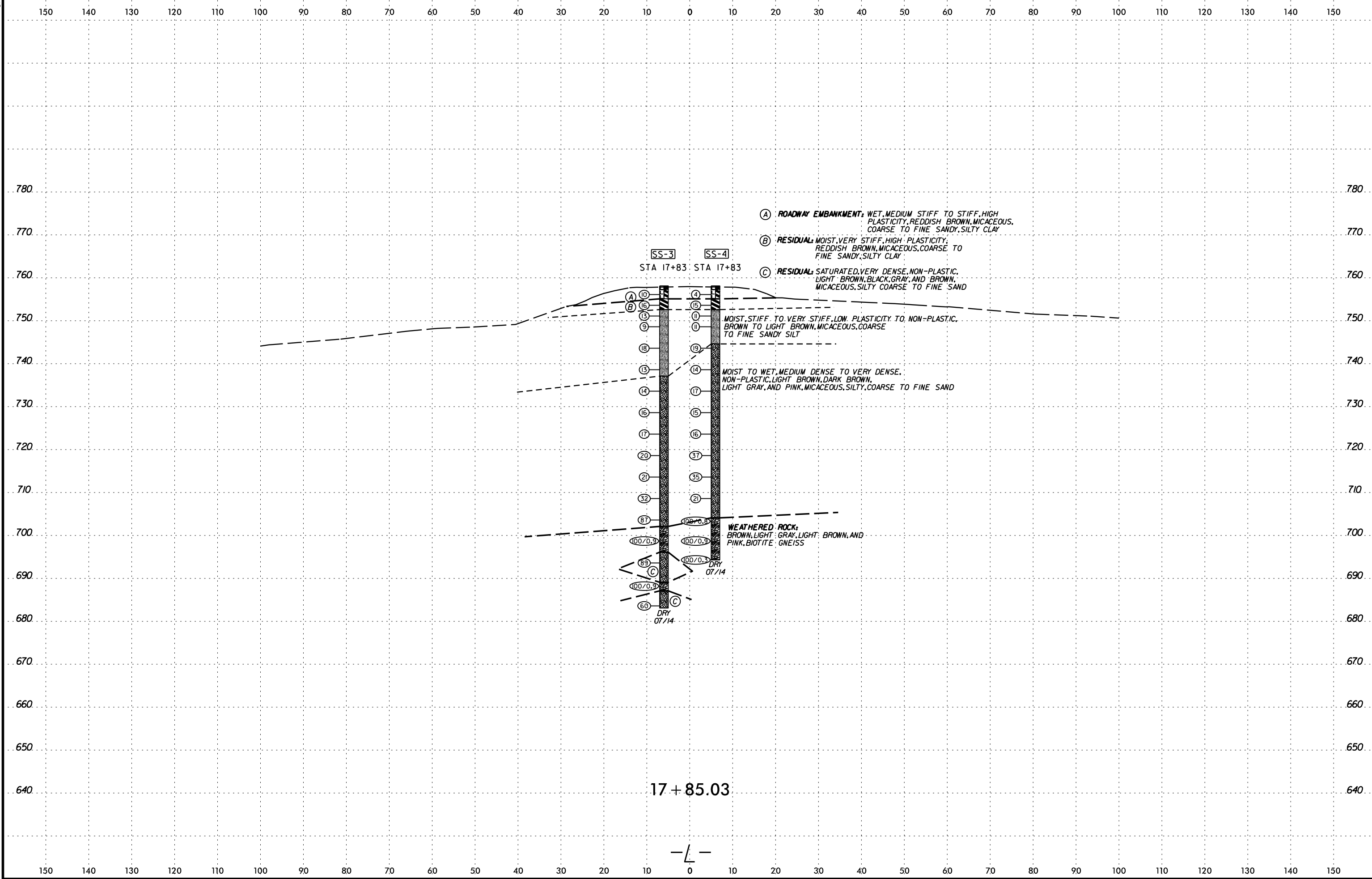
PROJ. REFERENCE NO.
B-4964

SHEET NO.
15

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

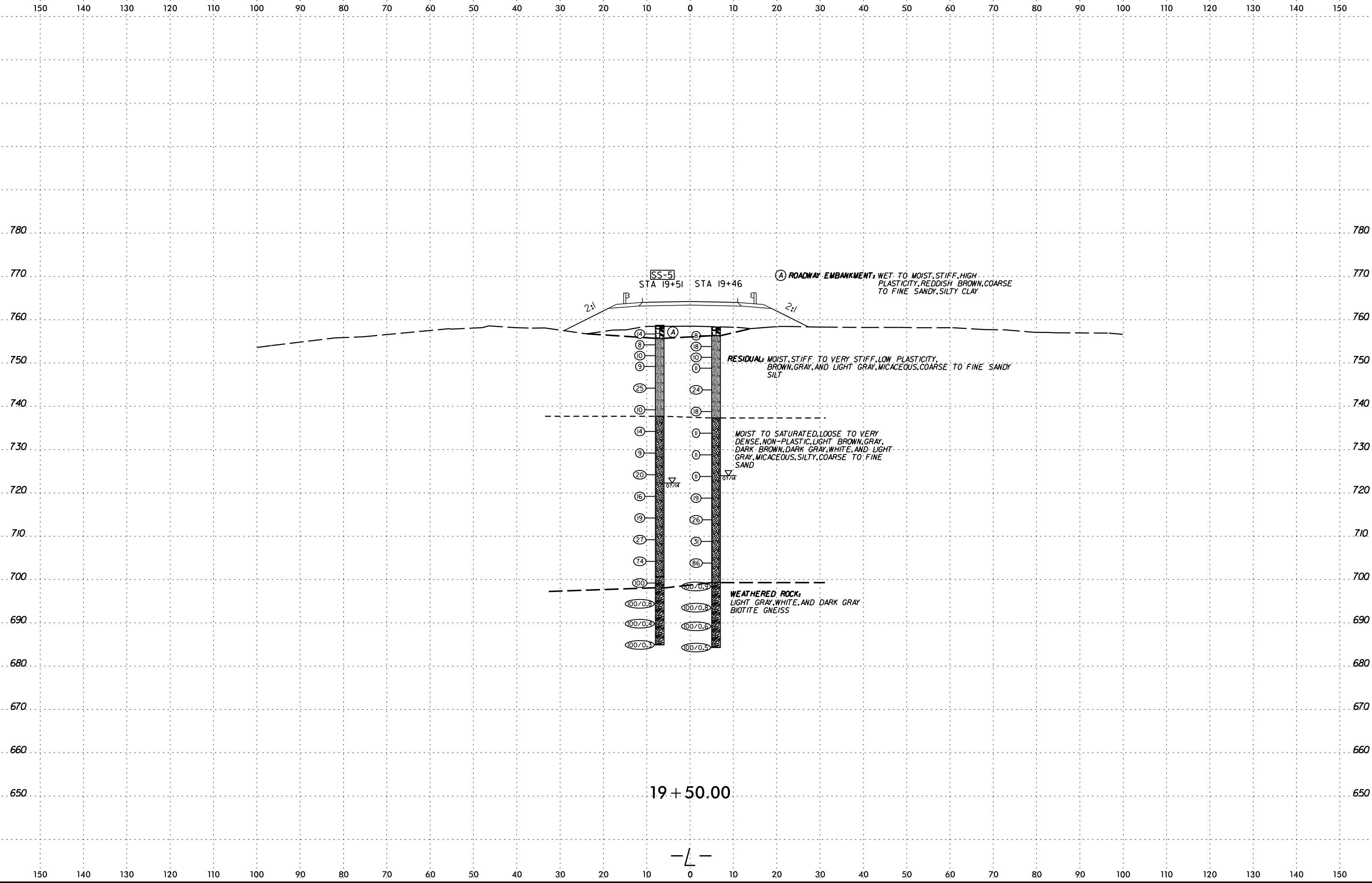


8/23/99



PROJ. REFERENCE NO.
B-4964

SHEET NO.
17



SS-5
STA 19+51

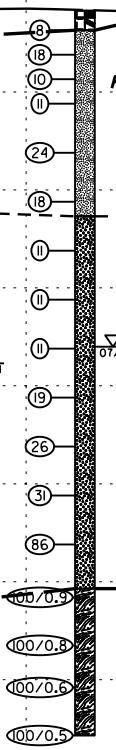
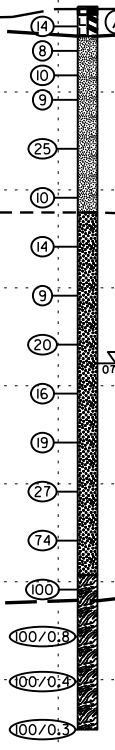
STA 19+46

(A) ROADWAY EMBANKMENT: WET TO MOIST, STIFF, HIGH PLASTICITY, REDDISH BROWN, COARSE TO FINE SANDY, SILTY CLAY

RESIDUAL: MOIST, STIFF TO VERY STIFF, LOW PLASTICITY, BROWN, GRAY, AND LIGHT GRAY, MICACEOUS, COARSE TO FINE SANDY SILT

MOIST TO SATURATED, LOOSE TO VERY DENSE, NON-PLASTIC, LIGHT BROWN, GRAY, DARK BROWN, DARK GRAY, WHITE, AND LIGHT GRAY, MICACEOUS, SILTY, COARSE TO FINE SAND

WEATHERED ROCK: LIGHT GRAY, WHITE, AND DARK GRAY BIOTITE GNEISS



19 + 50.00

-L-

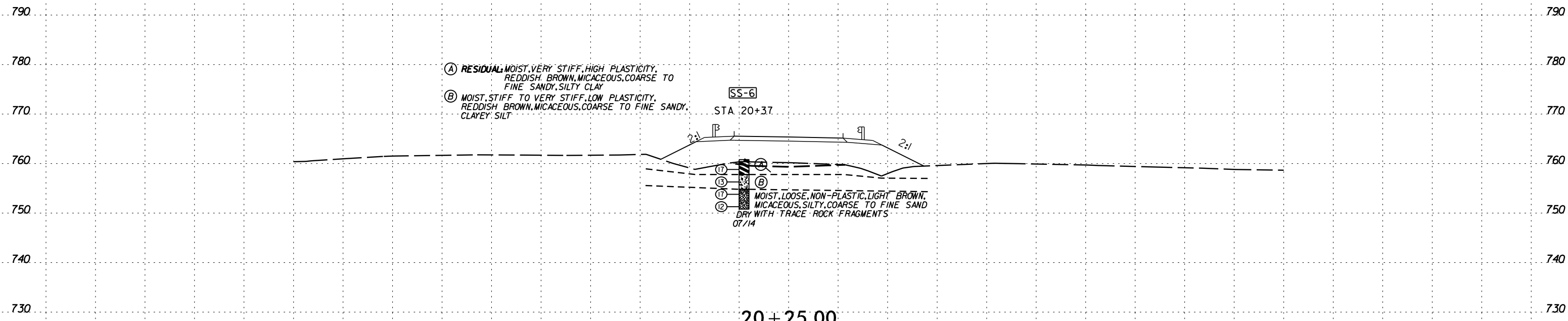
8/23/99



PROJ. REFERENCE NO.
B-4964

SHEET NO.
18

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



- (A) RESIDUAL, MOIST, VERY STIFF, HIGH PLASTICITY, REDDISH BROWN, MICACEOUS, COARSE TO FINE SANDY, SILTY CLAY
- (B) MOIST, STIFF TO VERY STIFF, LOW PLASTICITY, REDDISH BROWN, MICACEOUS, COARSE TO FINE SANDY, CLAYEY SILT

SS-6

STA 20+37

MOIST, LOOSE, NON-PLASTIC, LIGHT BROWN, MICACEOUS, SILTY, COARSE TO FINE SAND
 DRY WITH TRACE ROCK FRAGMENTS
 07/14

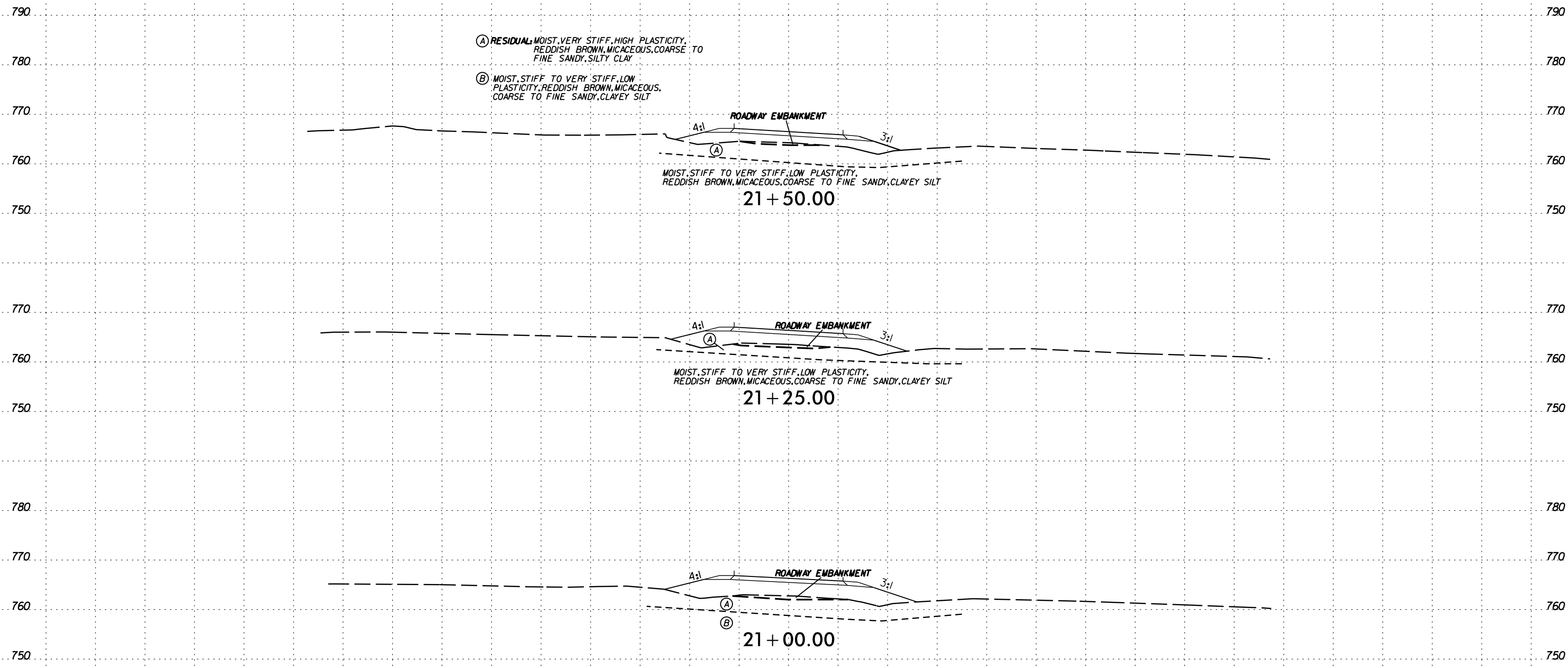
20+25.00

— L —

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



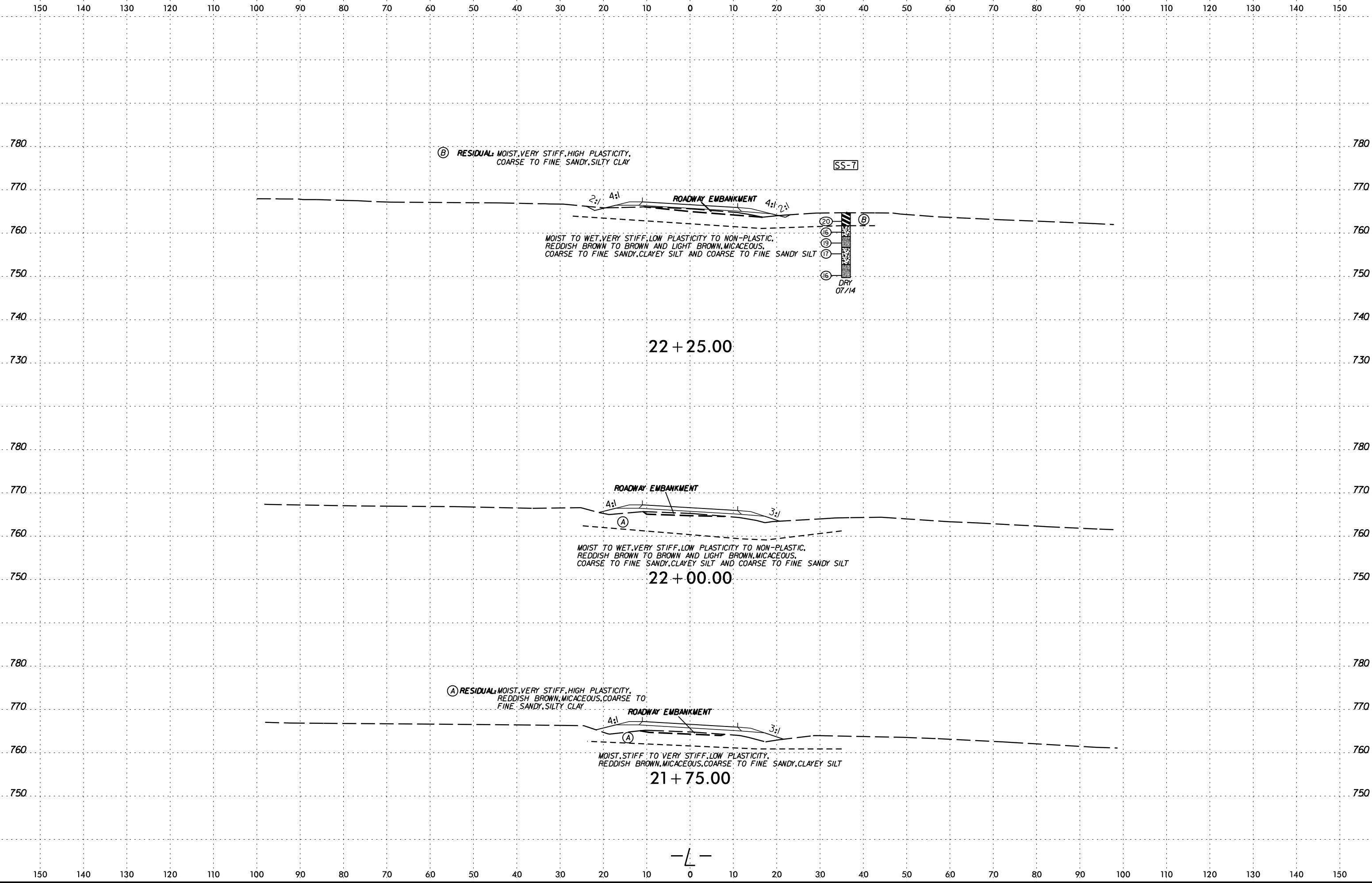
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8/23/99



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B-4964

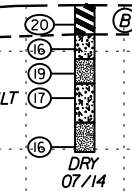
SHEET NO.
20



Ⓑ RESIDUAL: MOIST, VERY STIFF, HIGH PLASTICITY,
COARSE TO FINE SANDY, SILTY CLAY

SS-7

ROADWAY EMBANKMENT
MOIST TO WET, VERY STIFF, LOW PLASTICITY TO NON-PLASTIC,
REDDISH BROWN TO BROWN AND LIGHT BROWN, MICACEOUS,
COARSE TO FINE SANDY, CLAYEY SILT AND COARSE TO FINE SANDY SILT



22 + 25.00

ROADWAY EMBANKMENT

MOIST TO WET, VERY STIFF, LOW PLASTICITY TO NON-PLASTIC,
REDDISH BROWN TO BROWN AND LIGHT BROWN, MICACEOUS,
COARSE TO FINE SANDY, CLAYEY SILT AND COARSE TO FINE SANDY SILT

22 + 00.00

Ⓐ RESIDUAL: MOIST, VERY STIFF, HIGH PLASTICITY,
REDDISH BROWN, MICACEOUS, COARSE TO
FINE SANDY, SILTY CLAY

ROADWAY EMBANKMENT

MOIST, STIFF TO VERY STIFF, LOW PLASTICITY,
REDDISH BROWN, MICACEOUS, COARSE TO FINE SANDY, CLAYEY SILT

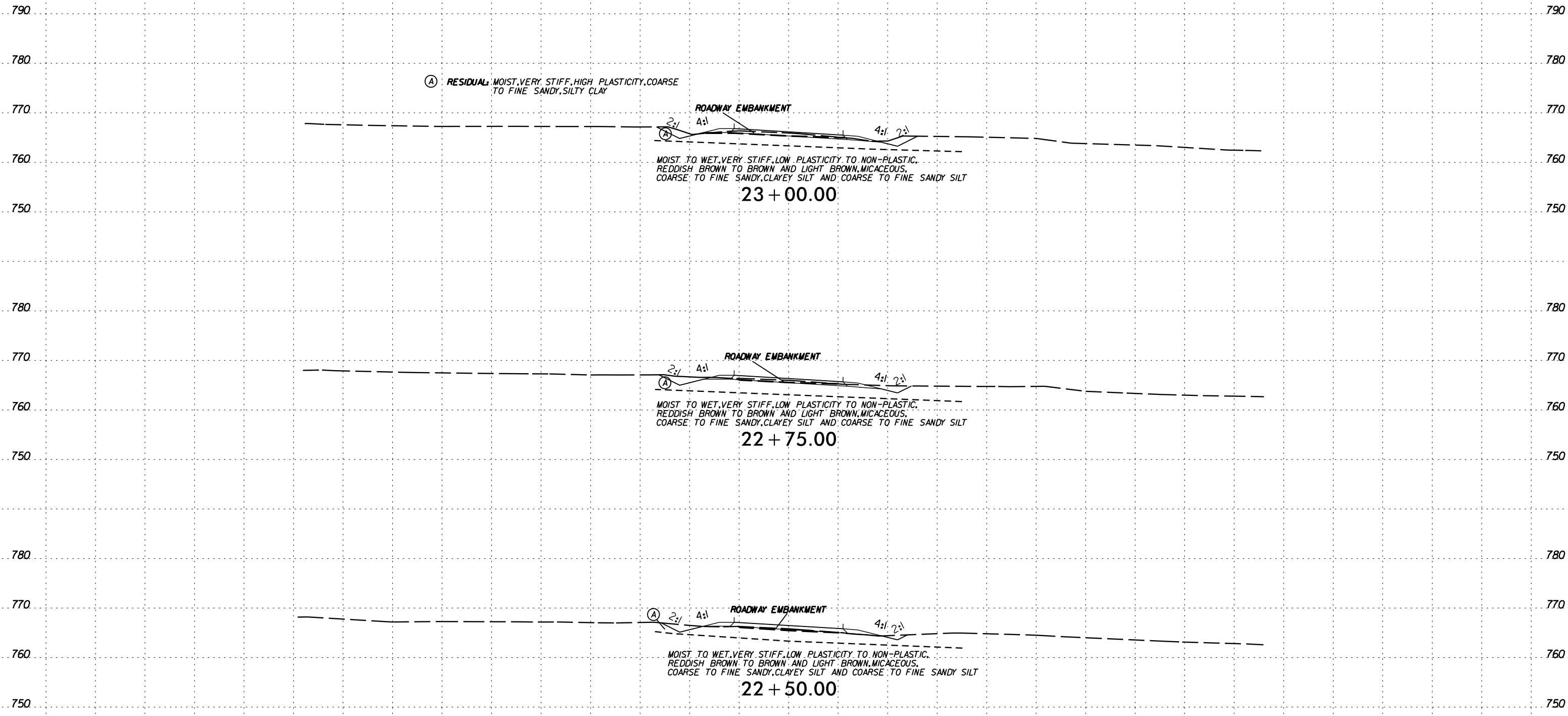
21 + 75.00

— / —

8/23/99



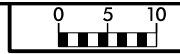
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



— / —

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

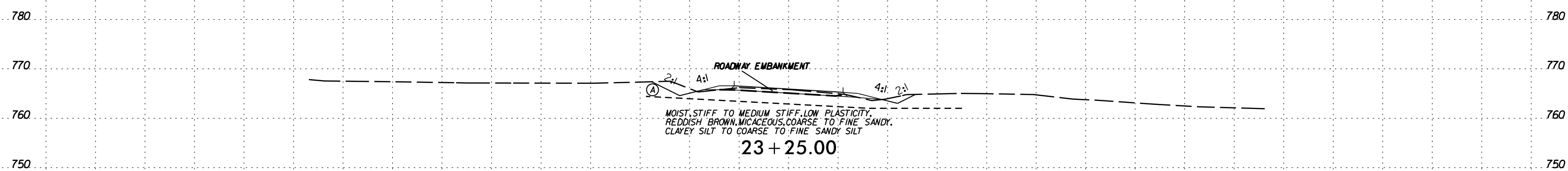
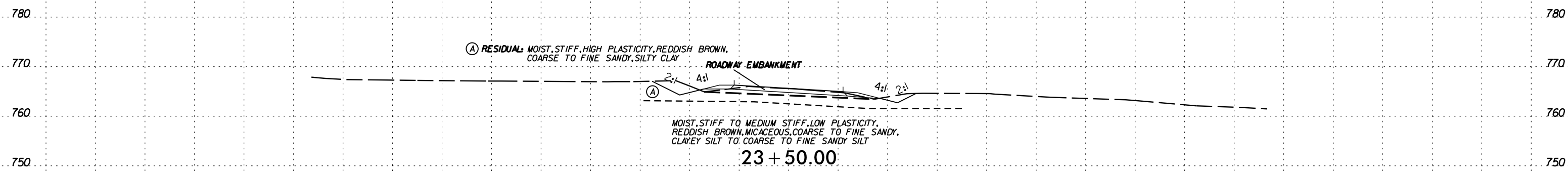
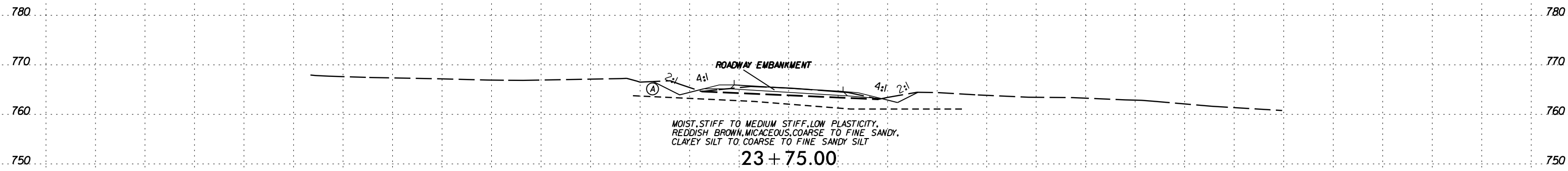
8/23/99



PROJ. REFERENCE NO.
B-4964

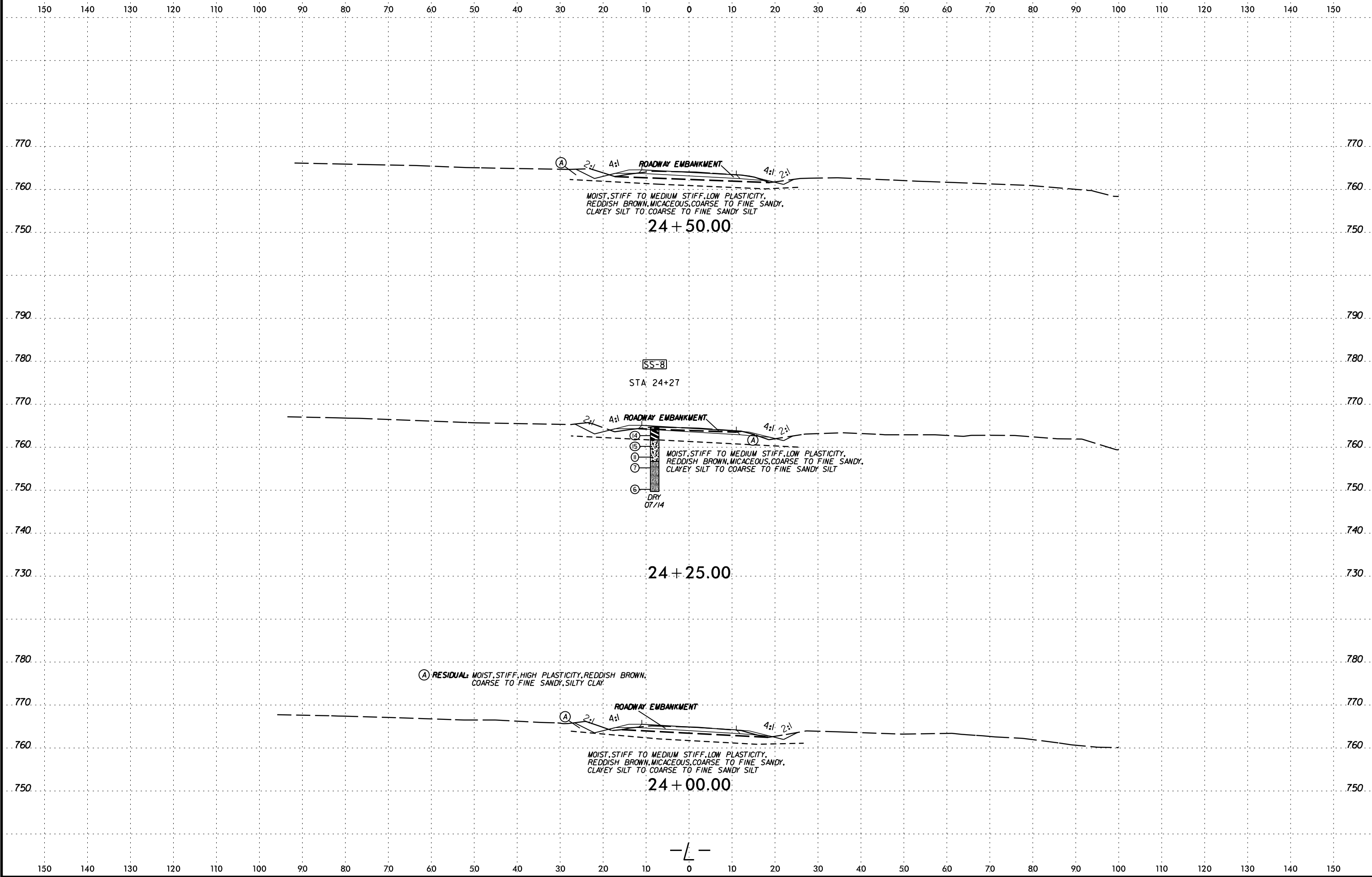
SHEET NO.
22

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— / —

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



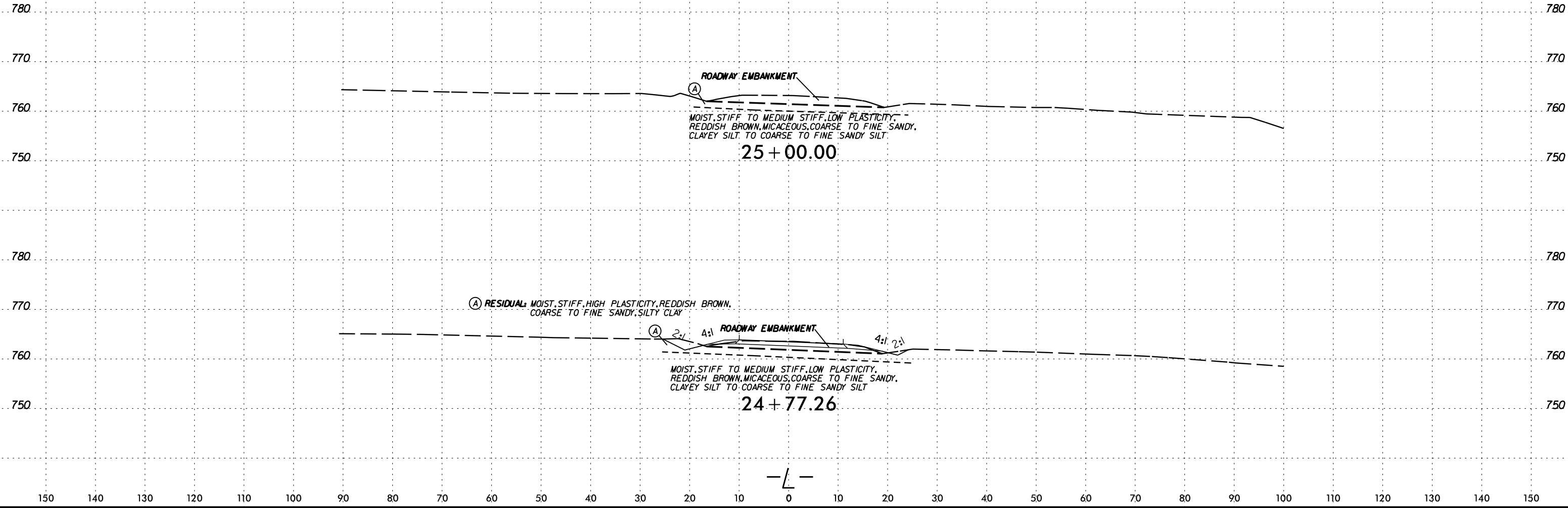
8/23/99



PROJ. REFERENCE NO.
B-4964

SHEET NO.
24

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



ROADWAY EMBANKMENT
MOIST, STIFF TO MEDIUM STIFF, LOW PLASTICITY,
REDDISH BROWN, MICACEOUS, COARSE TO FINE SANDY,
CLAYEY SILT TO COARSE TO FINE SANDY SILT

25 + 00.00

RESIDUAL MOIST, STIFF, HIGH PLASTICITY, REDDISH BROWN,
COARSE TO FINE SANDY, SILTY CLAY

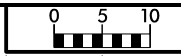
ROADWAY EMBANKMENT
MOIST, STIFF TO MEDIUM STIFF, LOW PLASTICITY,
REDDISH BROWN, MICACEOUS, COARSE TO FINE SANDY,
CLAYEY SILT TO COARSE TO FINE SANDY SILT

24 + 77.26

— / —

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

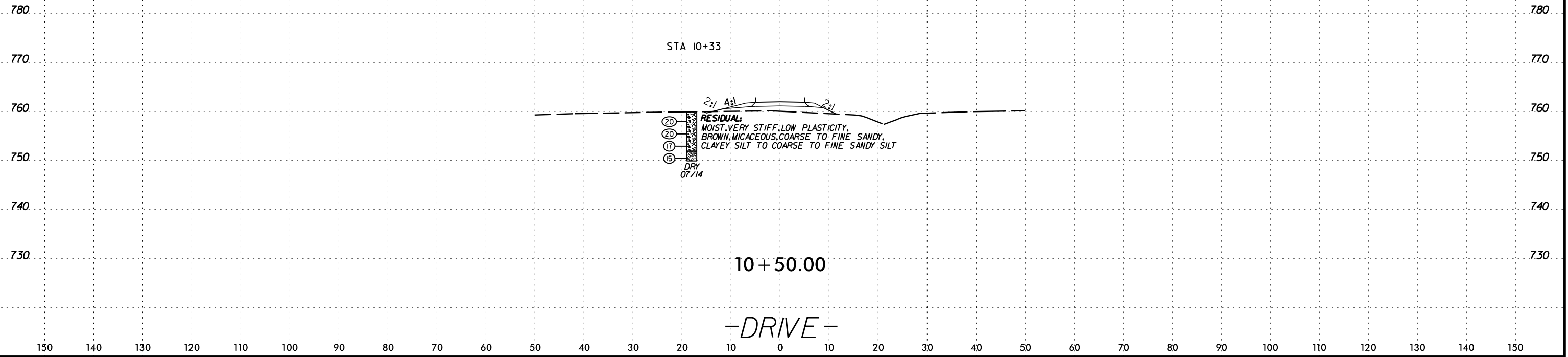
8/23/99



PROJ. REFERENCE NO.
B-4964

SHEET NO.
25

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



SUMMARY OF LABORATORY TEST DATA

PROJECT NO. 40242.1.1 (B-4964)
FA NO. BRSTP-2600(1)
COUNTY: ROCKINGHAM
BRIDGE NO. 85 OVER SOUTHERN RAILROAD ON SR 2600 (MIZPAH CHURCH ROAD)

| Sample No. | Boring Number | Station | Offset | Alignment | Sample Depth (ft.) | Natural Moisture Content (%) | AASHTO Class (Group Index) | N-Value (blows/ ft.) | Atterberg Limits | | | Gradation Results | | | | | | | |
|------------|---------------|---------|--------|-----------|--------------------|------------------------------|----------------------------|----------------------|------------------|------|------|-------------------|----------------|-----------------|---------------------|-----------------|---------------|----------|----------|
| | | | | | | | | | L.L. | P.L. | P.I. | Pass #10 Sieve | Pass #40 Sieve | Pass #200 Sieve | Retained #270 Sieve | Coarse Sand (%) | Fine Sand (%) | Silt (%) | Clay (%) |
| SS-1 | L_1229_RT | 12+29 | 26' RT | -L- | 1.0-2.5 | 34.5 | A-7-5(36) | 7 | 83 | 35 | 48 | 97 | 86 | 69 | 31 | 17.3 | 14.0 | 8.4 | 60.3 |
| SS-2 | L_1425_RT | 14+25 | 31' RT | -L- | 1.0-2.5 | 26.2 | A-7-5(35) | 19 | 76 | 35 | 41 | 100 | 96 | 79 | 24 | 7.7 | 16.4 | 9.8 | 66.1 |
| SS-3 | EB1-A | 17+83 | 6' LT | -L- | 3.5-5.0 | 26.4 | A-7-5(22) | 16 | 70 | 33 | 37 | 97 | 83 | 62 | 39 | 21.1 | 18.1 | 10.5 | 50.3 |
| SS-4 | EB1-B | 17+83 | 6' LT | -L- | 1.0-2.5 | 26.5 | A-7-6(16) | 4 | 54 | 26 | 28 | 94 | 84 | 62 | 38 | 18.7 | 19.1 | 15.2 | 47.0 |
| SS-5 | EB2-A | 19+51 | 7' LT | -L- | 1.0-2.5 | 23.9 | A-7-6(19) | 14 | 62 | 28 | 34 | 89 | 78 | 61 | 34 | 18.9 | 15.5 | 11.2 | 54.4 |
| SS-6 | L_2037_LT | 20+37 | 9' LT | -L- | 1.0-2.5 | 22.9 | A-7-5(29) | 17 | 65 | 36 | 29 | 99 | 88 | 69 | 33 | 17.3 | 15.5 | 17.4 | 49.8 |
| SS-7 | L_2225_RT | 22+25 | 36' RT | -L- | 1.0-2.5 | 23.2 | A-7-5(22) | 20 | 69 | 37 | 32 | 99 | 88 | 66 | 36 | 17.7 | 18.5 | 10.4 | 53.4 |
| SS-8 | L_2427_LT | 24+27 | 8' LT | -L- | 1.0-2.5 | 31.7 | A-7-5(43) | 14 | 85 | 44 | 41 | 100 | 96 | 85 | 18 | 6.8 | 10.7 | 13.1 | 69.4 |

SS = Split-Barrel Sample (ASTM-D-1586) ST = Shelby Tube (Undisturbed) Sample
 S = Grab Sample
 NP -- Non Plastic NA-- Non Applicable

Lab Technician: NCDOT Certification No.: 109-06-1003


 Jonathon Creech